

**DEVELOPING LONG-TERM  
COMPETITIVENESS THROUGH  
INFORMATION TECHNOLOGY ASSETS**

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## **Developing Long-term Competitiveness through Information Technology Assets**

### **ABSTRACT**

Claims that information technology can be a source of competitive advantage, which populated business literature in the late 1980s, have been largely discredited. Nonetheless, business executives continue to look for ways to apply information technology strategically to their businesses. Reporting on a two-year study of IT management practices, the authors note that some firms do appear to generate competitive advantage from their IT, but the advantage results from their IT *capabilities*, not from their IT *applications*. Specifically, a firm delivers value from IT by building and leveraging three assets: highly competent IT human resources, a reusable technology infrastructure, and a strong IT-business partner relationship. These three assets are interrelated in the sense that they tend to strengthen — or weaken — one another. Together, they allow a firm to apply information technology to strategic business needs faster and more cost effectively than the competition. This paper describes the characteristics of strong IT assets and offers strategies for developing them.

## Developing Long-term Competitiveness through Information Technology Assets

Consider the two quite different situations in which a retailer and an investment bank find themselves:

*A global retailer sees a competitor using information technology to enable a level of customer service well above the current industry standard. Clearly, the personalized service and expanded exchange of purchase and customer information enabled by the competitor's system will become the standard. The idea is a simple one, but the retailer's chief information officer explains that it requires access to data that is not available from existing systems. To leapfrog, or even copy, the competitor's system the firm would have to invest about three years and millions of dollars in new database, network and computing technologies. Given the firm's track record the estimates are believable. Given the competitiveness of the industry, they are not acceptable.*

In contrast...

*Several years ago an investment banking firm identified a mortgage-related product that it expected could generate significant income for the company. Within three months the company built the technology required to market and support the financial product and introduced it. Over the next eighteen months, while competitors were scurrying to develop technology for copycat versions of the product, the investment bank generated millions of dollars in revenues.*

What is it that allows the investment bank to rapidly deploy information systems to generate increased profits, while the retailer finds information technology a source of frustration? Unlike the retailer (and many of the bank's competitors), the bank's top information technology (IT) and business management teams had worked consistently over time to build organizational competence in applying IT to business problems. They had done so by leveraging three critical IT assets: highly competent IT **human** resources, a reusable information **technology** infrastructure, and a strong partnering **relationship** between IT and business management. At the retailer, on the other hand, IT staff sensed

neither the need to learn new technologies nor the opportunity to apply them; IT management responded to each systems request with independent solutions that did not attempt to build a flexible, manageable infrastructure; and senior management viewed IT planning and delivery as the responsibility of IT professionals. The retailer's weak IT asset base hindered its ability to create new services and respond to competitive pressures.

As information has become an increasingly important resource for organizations,<sup>1</sup> effective IT management has become critical to a firm's competitiveness.<sup>2</sup> Even as top managers acknowledge the importance of IT management excellence, many feel that their own IT investments often sink into black holes, generating minimal value for their businesses. Some have attempted to remedy ineffectiveness with supposed quick fixes, such as outsourcing of the IT function<sup>3</sup> or replacement of legacy systems with large, integrated software packages like SAP.<sup>4</sup> These strategies, however, do not guarantee salvation for failing IT units. In fact, research that we have conducted at twelve large firms over a two-year period suggests that success with strategies like IT outsourcing, large-scale software implementations, and introduction of IT management "best practices" is dependent upon strong human, technology and relationships assets. Developing those assets, meanwhile, requires constant attention and long-term persistence.

### **Delivering Value from IT**

Recent research on the resource-based view of the firm suggests that firms compete on the basis of their unique valuable resources. This theory argues that organizational capabilities developed over time and consistently renewed by management practice can be the source of competitive advantage.<sup>5</sup> Contrary to early work that proposed that *IT applications* offered the potential for competitive advantage,<sup>6</sup> the resource-based view of the firm suggests that it is the consistent development of the *capability to apply IT to business opportunities* which enhances competitiveness.<sup>7</sup> The key distinction is that a firm's IT applications are reproducible across firms, whereas a firm's capability to apply IT strategically can be inimitable.<sup>8</sup>

Consequently, disillusionment with the view of IT as a strategic weapon,<sup>9</sup> has given way to the recognition that firms like Merrill Lynch and Federal Express have consistently generated value from their IT capabilities. IT is now viewed as an enabler of strategic initiatives like business process

reengineering,<sup>10</sup> customer intimacy,<sup>11</sup> organizational learning,<sup>12</sup> and even organizational transformations.<sup>13</sup> IT in these applications has no value apart from the processes it supports, but the underlying resources, or management assets, can offer sustainable competitive advantage because they are difficult, if not impossible, to imitate across firms.

IT management becomes a competitive weapon when (a) IT plans are aligned with the firm's strategic business priorities, (b) new systems and capabilities are delivered quickly, and © operations and support are cost effective. In other words, firms gain competitive advantage when they can consistently identify and implement strategic applications faster and more cost effectively than their competitors. Their ability to do so depends upon the strength of their IT human resources, technology infrastructure, and IT-business relationship.

Schneider National, Inc., a large truckload carrier, is an example of a firm that derives value from IT through strong IT management assets. Trucking is an extremely competitive industry in the U.S., with as many as 50,000 firms competing on the basis of price and customer service. In light of the low margins in the industry, Schneider traditionally deploys second generation mainframe computers in a highly efficient, centralized processing architecture intended to meet customer needs at the lowest possible cost.

In 1988, despite its culture of cost-consciousness, Schneider spent millions of dollars to become the first large carrier to equip its trucks with satellite dishes and onboard terminals. Focused on a strategy of customer service and cost effective operations, Schneider's CEO saw in satellite an opportunity to significantly improve the firm's capability to track customer loads and reduce the amount of unproductive (i.e., non-driving) time drivers spent communicating about load assignments. Schneider achieved the benefits it sought, but, as expected, other firms followed suit, and satellite became a prerequisite for doing business as a large trucking firm. However, Schneider has sustained its first-mover advantage by relying on continuously identifying and implementing new processes that use satellite data to support critical operations such as load scheduling and customer communication. In this way it has incrementally improved its ability to provide a very high level of customer service at a low cost.

Because other trucking firms were able to duplicate Schneider's use of satellite, the technology itself

did not provide sustainable competitive advantage. However, Schneider has consistently generated value over the years from its ability to apply IT to business opportunities ahead of the competition. Currently, it is moving aggressively to take over other firms' logistics operations. This is an entirely different business from trucking but one that is similarly dependent on fast, cost effective, strategic implementations of IT. Relying on its IT competence, Schneider has been able to transform itself from a trucking company to an "asset-based logistics company."<sup>14</sup> Like other firms that consistently generate value from their IT investments, Schneider has been able to do this because it has developed a competency for managing information technology that is based on building and leveraging the three strategic IT assets.

### **The Three Information Technology Assets**

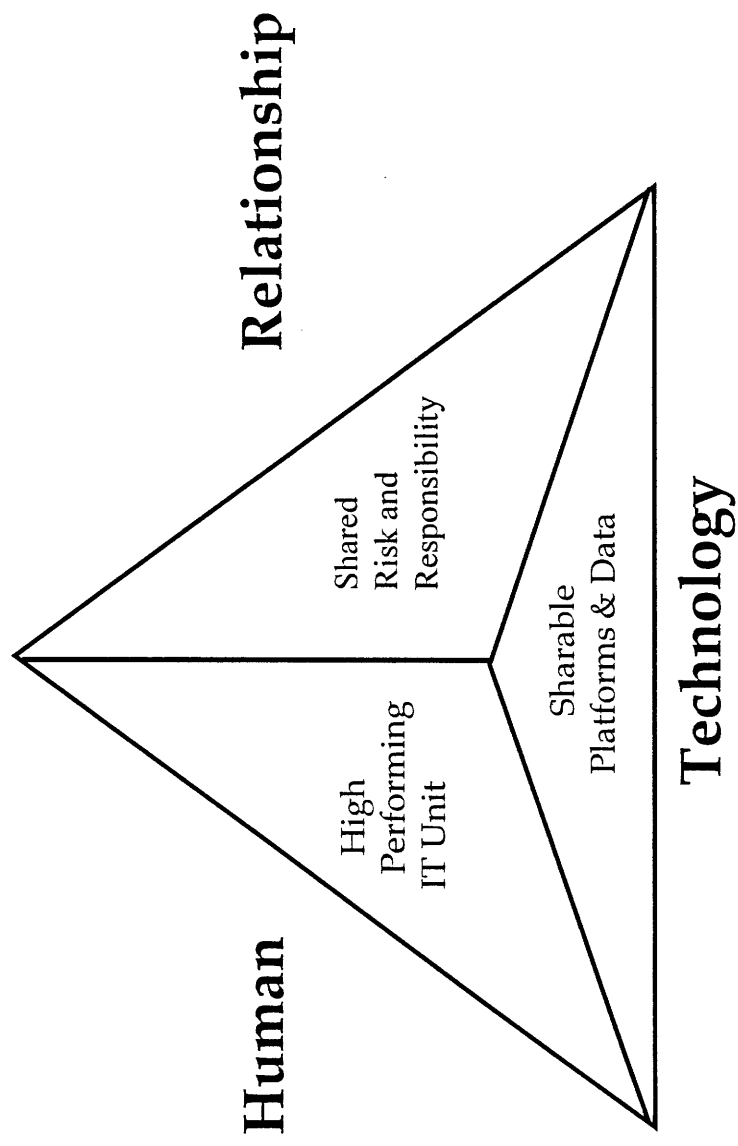
Firms like Schneider National have developed a competency for applying IT to business opportunities that is adaptable to ever-changing business opportunities. This competency is based on organizational assets that, by definition, cannot be readily purchased or reproduced by other firms. Strategic assets are created and enhanced through organizational experiences, and they provide competitive advantage precisely because they are not easily imitated. Our research suggests that three assets — human, technology, and relationship — can lead to distinctive competencies in IT management. (See Figure 1.)

*The Human Asset* — Highly motivated IT staff who have accumulated firm-relevant information technology knowledge and competence are key to a high performing IT unit. The defining characteristic of a strong human asset is an IT staff that consistently solves business problems and addresses business opportunities through information technology. There are three elements to this capability: strong technical skills, excellent understanding of the business, and IT teams that are empowered to work closely with clients to address business needs.

Rapidly changing technologies that are powerful but immature have generated a renewed emphasis on the technical qualifications of IT staff. These staff apply their technical skills to the need to build bridges between old systems and new, to deliver data across locations and applications, and to recognize opportunities to apply new technologies as they become available. Not only do they

# Figure 1: IT Strategic Asset

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possess skills with technologies that are in place in the organization, they are capable of adapting to changing technologies because they are adept at learning new technical skills.

IT staff acquire business understanding through close contact with clients. For many IT units this has meant distributing some IT teams to individual business units. Others have assigned high level IT staff as account managers or relationship managers to work closely with line managers in defining IT requirements and leading IT initiatives. In some cases, IT staff often spend time at external customer sites to adapt their systems to customer needs. These close working relationships allow IT staff to observe business processes in action and accumulate experience in solving business problems. In addition, staff who work very closely with clients, and who therefore see clearly and sometimes dramatically the benefits to be achieved from their efforts, tend to be highly motivated.

Empowered IT teams are responsible for solving important business problems rather than merely completing well-defined tasks. CIOs of IT units that are organized around empowered teams note that pushing responsibility for problem-solving onto teams results in more creative thinking. One CIO started implementing team structures when he realized that "I had recruited lots of smart people, but I didn't expect most of them to think." These empowered teams learn that they need to work closely with their customers to develop implementable solutions, leading to increased communications bandwidth between IT and business staff.

*The Technology Asset* — The technology asset consists of sharable technical platforms and data bases. A strong technology asset is essential for integrating systems and making IT applications cost-effective in their operation and support. Two distinguishing characteristics of the technology asset are (a) a well-defined technology architecture and (b) data and platform standards.

As IT becomes distributed throughout firms and even beyond their boundaries, IT managers and their business partners need a clear vision of where individual technology components and responsibility for those components will be located. Firms with solid architectures have elaborated rules for distributing hardware, software and support — independent of individual applications. These rules specify what kinds of data will be shared and how it will be stored, where servers will be located, and how applications and technologies will be supported. Each new application, then, moves the firm closer to the IT capabilities and management approaches defined by the architecture.



Firms without well-defined architectures have dealt with the challenges of distributed computing by first delivering systems and then thinking about how to support and connect them. The result is that the systems are either poorly supported or expensive to operate or both. In firms with a well-defined architecture, integration requirements and support considerations drive system design so that new systems not only meet business needs, they are also cost-effective.

Standards are the second distinguishing characteristic of the technology asset. They are one mechanism by which the firm achieves its architectural vision. Standards limit the range of technologies that IT staff must support, enabling them to provide faster, more cost effective support.<sup>15</sup> They also simplify systems integration efforts, which can speed the delivery process. Most firms have occasions when they will choose to disregard standards, but a well-defined architecture, supported by carefully considered and regularly reviewed standards, allow IT and business managers to engage in informed discussions of both the costs and benefits of not conforming to standards.

One firm established clear infrastructure standards to guide the development efforts of its distributed IT staff. When one development team was persuaded to deliver an urgent business solution on a nonstandard tool, the CIO acknowledged the value of the nonstandard solution but argued that the business should acquire external support for the system. In this way, the cost of not conforming to standards was clearly visible. Long-term, the system can be rewritten to standard, or the standard can be reassessed and revised.

*The Relationship Asset* — A strong relationship asset is characterized by IT and business unit management sharing the risk and responsibility for the effective application of IT in the firm.<sup>16</sup> Shared risk and responsibility require trust and mutual respect between IT and clients, and an ability to communicate, coordinate or negotiate quickly and effectively.<sup>17</sup> Evidence of a strong relationship asset includes (a) business partner ownership of, and accountability for, all IT projects, and (b) top management leadership in establishing IT priorities.

An example of business partner ownership of IT projects can be seen at Gillette, a global consumer manufacturing firm, where most major IT projects are implemented across divisions or functions. Aware of the inherent implementation hazards, the IT unit only undertakes projects championed by a senior business manager who has cross-functional or cross-divisional responsibility. The senior

manager appoints a line manager as co-leader of the project team, while a top level IT manager appoints a technical IT leader. This joint project management has ensured joint accountability, facilitating negotiations on issues such as business and IT resource allocation, system functionality, cost, and implementation schedules.

To ensure that limited resources are invested wisely, top management must be involved in establishing IT priorities. In many cases firms have established committees of senior managers to act as IT steering committees, which articulate organizational strategies either at the corporate or business unit level and specify how IT should support them. To be effective, however, most steering committees need a proactive CIO to identify opportunities for IT-enabled strategic processes.<sup>18</sup> For example, at one retail firm the CIO predicted that business needs would increasingly require a more flexible network architecture. He convinced senior management to invest in the infrastructure — before the need became urgent — with the help of a videotape that presented an external customer's view of the check-out process in the current environment contrasted with the more efficient process enabled by the proposed architecture.

While the steering committee sets the tone of the IT-business relationship at the top of the organization, this relationship grows out of accumulated experiences in planning, developing and using information technology at all levels of the firm. We found that the more IT and clients worked together, the more they communicated, coordinated, negotiated, laughed and cried together, up and down the hierarchy, the stronger was the partnership, and the more effective *both* were at planning for the future, developing new applications, and using their current information technology.

The three IT assets, while quite distinct, are highly interdependent. For example, the relationship asset is heavily dependent upon mutual respect, which means that business partners must view the IT staff as being competent (human asset). At the same time, competent IT staff can only develop a strong technology infrastructure if business partners accept some accountability for IT projects (relationship asset) and top management provides sufficient investment in a well-defined architecture (technology asset). The architecture is valuable only if it supports business needs, as articulated by senior business managers (relationship asset), and is effectively and efficiently managed by competent IT staff (human asset).

In other words, the assets are mutually reinforcing. For example, a high performing IT staff at the Travelers spent years developing a highly cost effective technology infrastructure. Nonetheless, the CIO determined that relationships with the business units were limiting the IT unit's effectiveness. He distributed IT staff to business units and leveraged the two strong assets to build the relationship asset, which significantly improved the firm's ability to identify strategic IT applications. Conversely, a weak human asset at another firm was accompanied by poor working relationships with the business. The limitations in both human and financial resources led to the deterioration of what had been a strong technology asset. All three assets, as well as the firm's general IT competence, have entered a downward spiral. The reinforcing nature of the assets suggests that they are normally in a state of near-equilibrium. Improvements in one can be used to bolster the other two. Similarly, neglect of any one is likely to have a negative impact on the others.

### **How The Three Assets Contribute to Business Value**

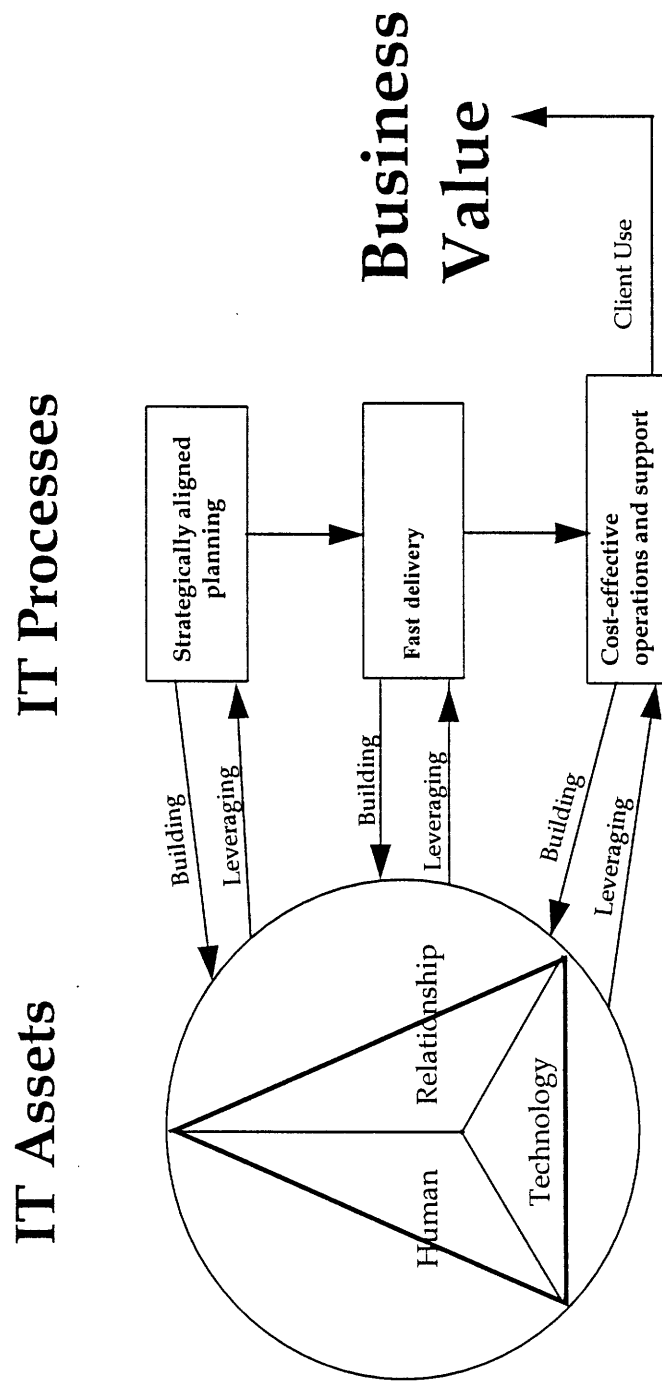
Figure 2 summarizes our view of how IT assets lead to business value. The IT assets support IT planning, delivery and operations processes. To the extent these processes are strategically aligned, fast, and cost effective, they result in competitively important IT-enabled business processes.

Not only do the assets impact IT processes, but over time the processes also gradually alter the state of the assets. Thus, the interplay between the three assets and the three IT processes determines how the firm is positioned to generate competitive advantage in the future. Two examples help to illustrate the interaction between the assets and value-generating IT processes.

*Top managers of the Workers Compensation Claims business at Travelers asked IT to develop a workstation that would provide case managers with the information they needed for improved customer service and increased productivity. The division's IT unit agreed to learn a variety of immature technologies in order to deliver a state-of-the-art desktop system. Meanwhile, the divisional IT staff also worked with the corporate IT unit that would be responsible for supporting the distributed application. The corporate unit took advantage of its considerable technical competence and the firm's existing mainframe support infrastructure to build a centralized support service for all client/server applications.*

Figure 2: Delivering business value from information technology

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*The new technologies resulted in a development effort that was plagued by technical uncertainties, delays, and budget overruns. However, the highly trained IT staff persisted in efforts to overcome technical limitations. They benefited from a long-term relationship with their business partners that enabled them to work together to ultimately deliver a system that they believe has given the company several years' head start on the competition. And the centralized support infrastructure, while expensive in the short run, ultimately proved to be highly cost effective.*

Travelers leveraged three strong assets to deliver a system that has allowed the firm to take on more customers at higher levels of service with no additional staff. The human asset consisted of a very professional, highly motivated IT staff that accepted responsibility for learning new technologies and had the confidence to apply those technologies to a major project. The technology asset was leveraged in providing a base for supporting a major new system reliably and cost effectively. Finally, the relationship asset was key to continued commitment to a risky project when unanticipated problems stalled the effort.

Notably, the project not only *leveraged* the assets, it *strengthened* them. The human asset grew from significant experience with new technologies that were immediately reused in a subsequent project. The technology infrastructure was expanded to provide solid support of distributed systems. And the relationship grew stronger as shared success increased mutual respect. Not only did the project yield a system that is extremely valuable in its everyday use, the firm is now poised to identify and deploy more valuable systems in the future.

In contrast, a manufacturing firm with a strong asset base undertook a project that had the opposite effect.

*Hi-Tech (a pseudonym) designed a state-of-the-art system to support its global purchasing agents. Early project developments resulted in a high level of enthusiasm from committed IT and business team members. However, midway through the project, Hi-Tech decided that future projects would use a different base technology (Unix as opposed to OS-2). As the system neared final implementation and the developers sought to hand over responsibility for*

*support to central IT staff, no one was prepared, technically or organizationally, to support a system that had been developed on what had become a non-standard platform.*

*With the emphasis shifting away from the technology they knew best, most of the developers left the company for positions in organizations where their expertise would be more highly valued. Business partners grew frustrated with a system that had great potential but persistent problems. And the firm had a system in its portfolio that did not meet standards. An extensive support structure was developed for just this one application, significantly increasing its operating costs.*

This project resulted in a depleted human asset, a more expensive and less effective technology infrastructure, and decreased trust in IT. Although recent projects have enabled the firm to more than recover from this unsuccessful effort, this example illustrates how precarious the IT assets are. Every experience results in either stronger or weaker assets.

### **A Plan of Action for Accumulating Valuable Information Technology Assets**

Our study suggests that IT executives, in conjunction with their business counterparts, should constantly assess the status of their three IT assets and develop strategies to attack weaknesses and leverage strengths. They should first perform a self-assessment by responding to the questions in Appendix A, *IT Asset Assessment Questions*. A high percentage of affirmative responses from both IT management and key internal customers suggests that assets are strong. Second, IT management should develop specific goals for each of the assets and an action plan for achieving those goals. The unit can then be measured on its progress in meeting goals. Finally, IT units must understand the status of their assets relative to their competitors. Only competitively superior assets will generate real value for the firm.

As shown in Figure 3 the assessment of IT assets should be combined with a competitive assessment in terms of whether the firm faces immediate competitive threats or whether it dominates its competition. The market assessment that accompanies the asset assessment will help a firm understand its time line for developing its IT assets. Figure 3 classifies each position on the asset

Figure 3: Assessment Grid for IT Assets

State of Assets	The Competitive Environment	
	Immediate Threat	No Immediate Crisis
Weak	<b>Sinking</b> <i>start bailing</i> Rapid, risky change	<b>Drifting</b> <i>grab a towline</i> Relationship building
Strong	<b>Tacking</b> <i>come about</i> Focused response	<b>Cruising</b> <i>full speed ahead</i> Adaptive learning

assessment grid as one of four states and identifies an appropriate asset-development strategy for each.

*Sinking — Start bailing.* Firms with weak IT assets that are facing immediate competitive threats are, in nautical terms, *sinking*. These firms need to turn around their assets quickly before IT becomes a competitive liability, if that is not already the case. Situations such as these require risky and often expensive moves to try to speed up a process that is evolutionary in nature. Appropriate strategies would include assessing the ability of current top IT managers to swiftly bring about change; assigning top business and IT people full-time to identify and then deliver key systems and capabilities; and contracting for or hiring top technical talent.

One large firm that had been operating at a loss for several years and had trouble responding to competitors' IT-based initiatives recognized that its IT assets were very weak. Top management confronted this weakness by bringing in a new CIO. The new CIO focused first on the relationship with business partners, assigning a high-level IT manager to each business division to identify strategic IT needs and then oversee their delivery. The relationship building soon improved alignment between IS resource allocation and business needs, but it could not quickly build IT skills or transform a weak technology infrastructure. Consequently, the firm entered into a major outsourcing agreement as a way to more quickly train, tool and augment the IT staff.

In short, the strategy for firms with weak IT assets in a threatening environment requires a significant influx of business confidence in IT where none has existed in the past and where the IT skill set may not be sufficient to substantially enhance what is probably a weak IT infrastructure. Top management should recognize that investments of both top management time and firm money are needed to change course, and even these cannot assure success. In the above example, it is not clear whether the set of changes will turn around the IT assets fast enough to help turn around the firm. The changes that have been made are viewed optimistically within the firm, but they require some time before they will result in noticeably improved assets—and before those assets can consistently enable new value-generating business processes.

*Drifting — Grab a towline.* Firms that have weak IT assets but are not facing immediate competitive threats have more time to recover, but their weak assets could easily pose a threat to the firm's competitiveness. In nautical terms, we think of these IT units as *drifting*, looking for direction from



the business. They should 'grab a towline' in a sense, to target their resources for the most immediate benefit. They will need to build all three assets almost in parallel, but they should start by involving their business partners. They can do so by discussing strategic priorities with top managers or by assigning teams to specifically support the immediate needs of individual business units. They will want to identify *quick hit* applications to build client enthusiasm.

A global manufacturing firm whose technology infrastructure and IT skills had become outdated is an example of a firm in the drifting quadrant. This firm brought in a CIO from the business to increase management focus on the value of IT. When IT objectives had been clarified, the CIO returned to his business position and brought in a CIO with a strong technology background to deliver on management's new expectations for IT. The new CIO targeted for immediate action those concerns for which he could find a top level project champion and which could be implemented quickly. He then allocated key resources to these projects to ensure successful delivery. IT and business managers broadcast the success of early applications to others in the firm, which built momentum for more ambitious projects.

The strategy for firms with weak assets in non-threatening environments is similar to those of firms in the sinking quadrant, but they can be more deliberate, working to build and then leverage the relationship asset. Developing only a single asset, of course, is a recipe for failure. This was demonstrated by one CIO who focused intensely on IT's relationship with business managers, but was slow to develop a strong infrastructure. The mutual trust and respect he was able to engender dissipated over time when business managers sensed that no progress was being made in the firm's capabilities to apply IT.

*Tacking — Come about.* Firms with strong IT assets can encounter competitive threats, much as sailors who find themselves sailing against the wind. IT units in businesses that face competitive threats need to focus their capabilities to address the threat, much like sailors 'come about' to take advantage of the wind. Strong assets should enable them to survive the threat but they need to respond aggressively.

A large financial services firm that was facing intense cost pressures is an example of a firm in the leaking quadrant. This firm had built up a great deal of distributed technical competence and had

strong IT-business partnerships in many divisions. When top management responded to the competitive threat by mandating severe cost cutting across the board, IT management eliminated, in most cases, two or more layers of middle management and adopted a team-based management structure. The teams allied closely with business managers so that they could focus on firm priorities. This enabled the IT unit to focus its efforts on the highest value applications and support. Despite the bumps associated with the introduction of an entirely new organizational structure, the IT unit was able to respond to the need for cuts by becoming, in the minds of both IT and business partners, more responsive to strategic needs.

Firms with strong assets facing competitive threats need to be creative in their problem solving, and thus will rely heavily on the competencies of their human assets. They will also benefit from a standardized technology architecture that facilitates fast solution delivery and from an IT-business relationship that helps them focus resources on top priorities. Firms in this quadrant should emerge from competitive threats with a stronger asset base as a result of the experiences they accumulate in addressing the threat.

*Cruising — Full speed ahead.* When assets are strong, firms can find themselves *cruising*. In this case they will want to continue moving ‘full speed ahead’ to build the assets necessary to stay ahead of the competition and be able to react quickly to competitors’ moves. Firms positioned in the cruising quadrant can focus on identifying new opportunities to sustain their competitive positions and build their assets. These firms should regularly experiment with new, immature technologies to learn whether they offer unique opportunities to their businesses, while replacing outdated legacy systems and redesigning inefficient processes.

One high technology firm that falls into the cruising quadrant regularly works to enhance its strong asset base. In particular, IT staff pilot new technologies where existing technologies fail to meet customer needs. They also work to incorporate systems that have sprouted up on clients’ desktops into an existing and more cost-effective centralized support environment. The core technology group tackles the problem of developing support tools for client-server computing, while also examining standard solution packages to determine how to provide reliable support. These efforts are all intended to keep the firm a step ahead of the competition.

Firms with strong assets that are not facing immediate competitive threats should focus on organizational learning as a means to continuously strengthen their assets and ward off competition. These firms must work to consistently improve their assets, focusing even more closely on strategic priorities, making short delivery cycles even faster, and looking for ways to make their operations even more cost effective. If they fail to continue to develop their assets, they will weaken them.

## **Conclusion**

Effective IT management is just one critical competency required for successful implementation of strategic business processes. As communications and information become ever more important business tools, however, the ability to support new strategies with fast, cost effective information technology will become increasingly important for anticipating and reacting to changing market conditions. Unless and until everyone does it well, information technology management can represent either a distinctive competency or a competitive liability.

Increasingly, firms are buying the same software packages, hiring similar contractors, and outsourcing to the same major vendors. Nonetheless, some firms are generating significant business value from IT while others are not. The difference is not in the reproducible technologies and skills they acquire or even in the implementation processes in which they deploy those technologies, but in their ability to build and leverage inimitable IT management assets. These assets, when consistently focused on identifying strategic applications of IT and delivering and supporting those applications quickly and cost effectively, can generate sustainable competitive advantage for a firm.

A firm's asset base is a precarious thing. Any weakness can undermine all three assets: the departure of key IT staff represents a loss of key IT-business linkages; repeated inattention to technology standards will increase charges to business units for IT support; failure to deliver on a promise to a business client interferes with future discussion of business needs for IT. In isolation, mistakes and brief inattention to the assets cause no harm, but longer term neglect of any of the assets will lead to the demise of a firm's IT competence.

As noted above, there are a number of strategies for developing and leveraging IT assets. Key to this effort is the vigilance of senior IT and business management in constantly assessing the status of the

assets and introducing management practices to further develop them. Building and leveraging IT assets is an organization-wide responsibility and it requires persistent effort.

## APPENDIX A: ASSESSING THE ASSETS

*Assessing IT human resources:* A strong human resource asset is highly motivated and knows how to solve business problems with information technology. A human resource plan should specify both the breadth of required knowledge -- including technical, change management and business knowledge -- and the pace at which new skills must be acquired. Some key questions to ask in assessing the IT human resource asset include:

- Do IT staff have technical capabilities that match the technology plan?
- Is there a plan for infusing or acquiring skills in new technology?
- Are IT staff expected by both IT and business management to solve business problems?
- Are IT staff close enough to the business to understand and predict business problems?
- Do IT staff regularly invest in technical, business, and interpersonal training?
- Are IT staff in the habit of learning?
- Do IT staff have negotiating, coaching and counseling skills?
- Do projects meet deadlines?
- Are development costs lower than those of our competitors?

*Assessing the technology asset:* A strong technology asset is appropriate for the business and reasonably consistent across the firm both within and beyond the IT-owned and operated boundary. Some key questions to ask in assessing the technology asset include:

- Have IT and business management defined a technology plan based on strategic business principles?
- Have IT and business management agreed on the nature and role of technology standards in that plan?
- Do IT and business management understand the costs and benefits of noncompliance with standards?
- Are business managers complying with the plan and with the standards?
- Are standards ham-stringing efforts to address business needs?
- Is there a plan for bringing non-standard systems into compliance?
- Is there a process for updating or changing inappropriate standards?
- Are data and information available to decision makers when they need it?

- Are system availability, system response times, and IT support costs better than those of our competitors?

*Assessing the relationship asset:* A strong IT-business relationship is characterized by high levels of respect between IT and clients; excellence in communication, coordination and negotiation on both sides of the relationship; and significant shared knowledge about the capabilities of information technology and the needs of the business. The relationship blueprint will specify IT and business unit responsibilities for planning, technology ownership and systems development, implementation and support; expected communication channels; and expected modes of coordination. Some key questions to ask in assessing the IT relationship asset include:

- Do IT and business executives share a vision for how IT will support the business?
- Do IT and business managers have overlapping, frequently used, formal and informal channels of communication at many levels of the firm?
- Do IT and business managers consult with each other regularly on business and technical decisions?
- Do all large development projects have active business executive sponsorship and leadership?
- Do IT and business managers have a mutual understanding of each other's responsibilities for planning, developing and supporting systems?
- Are IT and business managers satisfied with their abilities to communicate and negotiate with each other?
- Do clients have realistic expectations for IT services?
- Do IT and business partners negotiate priorities for cycle time, cost and flexibility?

## APPENDIX B: METHODS USED IN THE STUDY

Our project was carried out in three phases. The objective of the first two phases was essentially to gain a basic understanding of the issues related to managing IT in order to contribute to business value and at the same time winnow through a large set of companies in order to select 6 appropriate ones for in depth study.

*Phase I: Sept 1992 - December 1992.* We began the first phase of our study by seeking nominations of highly effective or innovative IT managers. We obtained nominations from 28 consultants, academics and practitioners (including many members of the APC). We also referred to the 1992 peer ratings of top IS organizations from *Information Week*, *Datamation* and *Computerworld*. Combined, these sources yielded 259 nominations of 149 different firms. We selected for further study the 60 firms that received two or more nominations. After dividing the companies among the three researchers, we contacted the top information systems executive at these firms. We conducted half-hour to hour long telephone interviews with 50 of these executives, asking them to describe three innovations in IT management they had undertaken in the past three years. We also asked why they had chosen those particular innovations and what they had accomplished so far. We took detailed notes during the interviews and transcribed them shortly afterwards. We analyzed this data essentially by coding both the initiatives and the objectives, using several different coding schemes. The results showed that there was more consistency in the executives' objectives than in their initiatives. Overall their initiatives were not very extraordinary -- in fact, we characterized most of them as more evolutionary than revolutionary. The more revolutionary changes we heard about were in the adoption of client/server architectures, self-managed work teams, business process reengineering and total quality management initiatives.

*Phase II: January 1993 - August, 1993.* In consultation with our project sponsors, we selected 12 of the 50 firms from Phase I for a closer look. We chose 6 firms that were building client/server applications and infrastructures and 6 that were implementing new team based structures. Client/server applications were selected because they were an example of a technology related initiative with the potential to change how firms apply information technology. Team-based structures are an example of a human resource related initiative with the potential to improve the quality of IS product and services. Again, we divided the 12 companies among the three researchers, so that each of us was responsible for 4 sites. During the site visits we interviewed IS and client managers about the nature of the new management practice, the reasons it was implemented, and its anticipated and achieved results. The number of interviews at each site ranged from 5 to 9. The interviews were typically an hour in length, and we taped and transcribed nearly all of them. We also gathered archival data, including annual reports, extracts of presentations on the new practices, architecture guidelines, statements of policy, organization charts and system requirements. To analyze this data, we began by working across the interviews and archival data of a single case to create a consistent picture of that case. Then, we compared the 6 cases within one innovation type (client/server or teams) to find trends and patterns within the innovation type. Finally, we examined the 12 client/server and the team cases as a whole to find trends and patterns common to both technical infrastructure and human resource innovations. Our findings from this phase confirmed that both client/server and team innovations could be strategic, could be risky, could reduce cycle time, relied on partnerships between IT and clients, had implications for standards, demanded new skills and professional development, and required significant investments.

*Phase III: September, 1993 - March, 1995.* For our third and final phase, we selected 7 of the 12 firms for further study based on a variety of factors, but mostly because they seemed to be the most interesting, most cooperative, or most likely to lead us to new insights on how IT contributed to business value. The firms are quite varied along several dimensions we considered important. For example, our sample includes some firms that are more “information intense” than others. One is quite a bit smaller than the others. There is variation in industry, variation in their objectives for their innovation, variation in the way the IT units staff and organize, and, of course, variation in the type of innovation they were pursuing. As it turned out, two of our “team” firms were actually more interesting in terms of other innovations, so within the group of 7 firms, we developed cases on four different innovation themes: client/server, self-managed teams, IS-business liaisons, and standards. We visited each site three or four times over the 18 months of the third phase, spending about a day at the company during each visit. During each visit we interviewed IT and client staff and managers, observed applications, attended presentations and meetings, and talked informally to our liaisons. We collected additional archival data. Most interviews were taped and transcribed. Following each round of visits the researchers met and continued their analysis of the cases. As in Phase II, we started each time with a within-case analysis, trying to develop a coherent story across data sources within each case. Then we proceeded to across-case analysis, in which we looked for patterns across the 7 cases. At the end of the analysis session we made plans for our next site visit. These plans were more opportunistic than structured. As each case unfolded, we sought to take advantage of the data collection opportunities that presented themselves at each site, not to collect the same data at each one.

By using this process we gradually developed our three asset model (Figure 1). One of the strengths of our analysis approach has been that the two researchers who have not been immersed in the details of a particular case have been able to bring a different and often more objective eye to the evidence. In essence, each of us has been a “devil’s advocate” for the analysis of the others’ cases.

We have taken three approaches to validate our model. First, we have shared our basic model and our cases (some of which are structured to reflect the model in Figure 1) with liaisons at our case sites. They have all responded positively to this analysis. Second, we have discussed the model with our project sponsors and other IT executives. They have also responded positively to the model. Third, we have attempted to raise the conceptual level by seeking corroboration for our findings in the general literature on the resource based view of the firm.



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